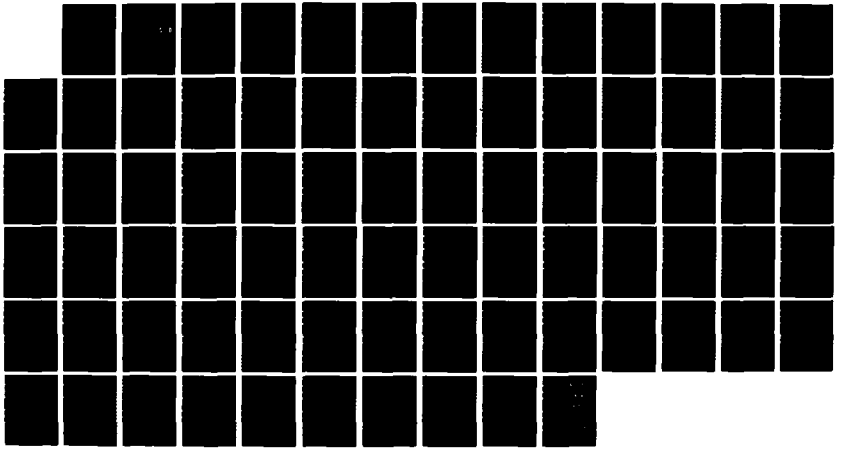
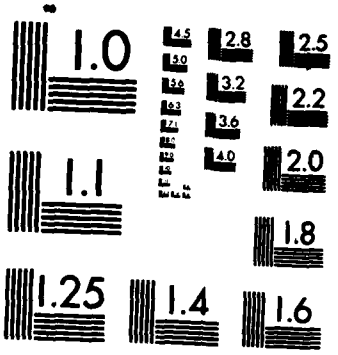
AD-A164 985 OCEAN FRONTAL AREASPPHYTOPLANKTON ENUMERATION AND BIOMASS ESTIMATES -- OP.. (U) UNIVERSITY OF SOUTHERN MISSISSIPPI HATTIESBURG G ANDERSON ET AL. JAN 86 1/1

UNCLASSIFIED N00014-85-K-0353 F/G 6/3 NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(12)

OCEAN FRONTAL AREAS

PHYTOPLANKTON ENUMERATION AND BIOMASS ESTIMATES -- OPERATION GUIDING LIGHT (APRIL-MAY 1985)

FINAL TECHNICAL REPORT FOR
CONTRACT #N00014-85-K-0353

SUBMITTED BY
GARY ANDERSON, PRINCIPAL INVESTIGATOR, AND
DANIEL GUSTAFSON, GRADUATE ASSISTANT
SOUTHERN STATION, BOX 5018
UNIVERSITY OF SOUTHERN MISSISSIPPI
HATTIESBURG, MS 39406

JANUARY 1986

OCEAN FRONTAL AREAS

PHYTOPLANKTON ENUMERATION AND BIOMASS ESTIMATES -- OPERATION GUIDING LIGHT (APRIL-MAY 1985)

FINAL TECHNICAL REPORT FOR

CONTRACT #N00014-85-K-0353

SUBMITTED BY

GARY ANDERSON, PRINCIPAL INVESTIGATOR, AND

DANIEL GUSTAFSON, GRADUATE ASSISTANT

SOUTHERN STATION, BOX 5018

UNIVERSITY OF SOUTHERN MISSISSIPPI

HATTIESBURG, MS 39406

JANUARY 1986

ABSTRACT

1. During the pilot field exercise for Operation Guiding Light (April-May, 1985), 39 phytoplankton samples were collected in the shelf-slope frontal region and 72 phytoplankton samples were collected in the Gulf Stream frontal region (both survey areas are located in the western North Atlantic Ocean). Samples were obtained using either a towed underwater pumping system (TUPS) at a depth of two meters or a rosette sampler (various depths) and preserved for subsequent analysis.

2. Based on preliminary pigment analyses completed several weeks subsequent to the cruise, the Chief Scientific Officer selected a total of 52 samples for analysis (21 TUPS samples and 31 station samples). For those samples, we identified (to species, where possible) enumerated and estimated biomass of the phytoplankton present.

3. The results detailed herein may be summarized as follows:

a) Phytoplankton biomass ranged from 5-29,308 $mm^3 \times 10^{-6}/\ell$.

b) Phytoplankton biomass south of the Gulf Stream front was significantly greater than north of the front or at the frontal boundary (TUPS samples); biomass estimates for station samples far exceeded those for underway samples and were usually substantially greater for samples obtained in cool water (12-16°C) than in warm water (18-21°C).

c) In the shelf slope-frontal region, estimated biomass for several of the underway samples was considerably greater than for any of the underway samples obtained in the southern survey area; in contrast to TUPS results obtained in the southern survey area, sample biomass south of the frontal boundary was low compared with that of samples obtained both at and north of the frontal boundary.

d) In most samples, biomass of dinoflagellates exceeded (often by 2-4 fold) biomass of diatoms; only in some of the samples obtained in the shelf-slope frontal area did biomass of groups other than diatoms and dinoflagellates comprise a substantial (>25%) proportion of total biomass.

Introduction

In 1985, personnel from the Department of Biological Sciences at the University of Southern Mississippi participated in the first phase of Operation Guiding Light, a study to evaluate oceanographic processes associated with ocean frontal areas. This study is being directed by the Naval Ocean Research and Development Activity. The primary objectives of our involvement were as follows:

1) We provided a graduate student to participate in the pilot field exercise of Operation Guiding Light (April-May, 1985) to study the shelf-slope and Gulf Stream fronts in the western North Atlantic Ocean. The student's shipboard responsibilities included collecting and preserving phytoplankton samples for subsequent analysis as well as assisting other cruise participants, when appropriate.

2) We analyzed selected phytoplankton samples during Summer, 1985. Our analyses included identification of phytoplankton (to species, where possible), enumeration of phytoplankton cells and estimation of phytoplankton biomass in 52 samples chosen by the Chief Scientific Officer.

This final report details our sample analyses. It includes a description of our methodology, tabulations of results for each of the 52 samples analyzed, and a brief discussion.

Materials and Methods

1. Sample Collection. Two sampling methodologies were employed during the pilot field study conducted during April and May 1985. Samples taken while underway were pumped aboard from a depth of 2 m using a towed underwater pumping system (TUPS) designed by NORDA. Water was collected within a 100 liter Nalgene vat equipped with a 20 μm mesh

plankton cup at the bottom. Phytoplankton samples were concentrated from known volumes (generally 40-80 ℓ) of seawater and preserved for subsequent analysis (see below). TUPS samples which we analyzed were obtained at several locations during one tow made in the southern survey area (Samples 1-7) and during two tows made in the northern survey area (Samples UPSN1-UPSN10 and UPSS1-UPSS4).

The second sampling methodology was utilized while on station. It involved collection of water samples from 30 ℓ Niskin bottles which were suspended via a rosette sampler at desired depths from 1-35 m. Samples (0.5 ℓ) obtained were preserved for subsequent analysis (see below).

2. Sample Preservation and Storage. The final sample volumes (all 500 cc regardless of sampling method employed) were determined using a graduated cylinder; 10 cc neutralized formalin (Throndsen, 1978) was added to each sample to make a 0.4% HCHO solution. The preserved samples were enclosed within polyethylene bottles and refrigerated until examined during Summer, 1985.

3. Selection of Samples for Examination. During the field exercise, samples were collected at 104 different locations. Since one replicate for each was also obtained, a total of over 200 preserved phytoplankton samples have been archived at NORDA. The Chief Scientific Officer selected 52 of them to be analyzed by us; selection was based on analyses of photosynthetic pigment distribution conducted by other cruise participants. Hence, the samples we investigated were expected to contain abundant phytoplankton relative to those we did not examine.

4. Examination of Samples. After shaking a sample thoroughly for one minute, a 50 ml aliquot of it was poured into a settling chamber for subsequent study using the Utermöhl technique (Hasle, 1978). After a

settling period of at least two days, samples were examined using a Zeiss inverted microscope equipped with phase contrast. Initially, samples were scanned at low magnification (160X) to determine how best to achieve a total phytoplankter count of at least 300, as recommended elsewhere (e.g. Woodmansee and McLelland, 1984; Fryxell et al., 1985). Where phytoplankters were dense, a random field method (Venrick, 1978; Woodmansee and McLelland, 1984) was selected; for samples with relatively few phytoplankters, the entire area of the settling chamber was examined. Phytoplankton were identified (to species, where possible) using the appropriate magnification (either 160X, 400X, or 1000X, depending on cell size). Identification aids utilized are provided in Appendix I.

For each species encountered, cell size was measured for 25 individuals (Smayda, 1978), wherever possible. Measurements of size included consideration of appropriate morphological features (i.e. spines, horns, etc.) as discussed by Smayda (1978). Such an approach was necessary so that average cell volume for each species could be estimated.

5. Calculations.

a. Average cell size (volume in $mm^3 \times 10^{-6}$) was determined for each species encountered in each sample by dividing the total calculated volume of all the cells measured (up to 25) by the number of cells measured. (Note: for irregularly shaped specimens such as dinoflagellates, cell volume was determined by summing the volumes of the various cell parts. For example, for Ceratium spp., the cell body was treated as a cylinder to which was added the volume of the cone-shaped horns. Formulae used for calculating volumes of the geometric shapes encountered are provided in Appendix II.)

b. Number of cells/liter was calculated for each species using the formula below:

$$N = C\left(\frac{A_t}{F \cdot A_f}\right) \cdot \left(\frac{\frac{V_s}{V_a}}{V}\right)$$

where N = cell number/liter, C = number of cells counted, A_t = area of the counting chamber, F = the number of fields counted, A_f is the area of the field, V_s is the sample volume, V_a is the aliquot volume and V is the volume filtered. (Note: when the total area of the counting chamber was examined, $\left(\frac{A_t}{F \cdot A_f}\right) = 1.$)

c. Biomass (in $mm^3 \times 10^{-6}/\ell$) was estimated for each taxon by multiplying cell volume by the number of cells present per liter.

All of the methods we have employed conform to procedures which have been outlined in the UNESCO Phytoplankton Manual (Sournia, 1978) and evaluated in detail therein by various workers [e.g., preservation methods by Throndsen; pump sampling by Beers; inverted microscope (settling) by Hasle; counting by Smayda and Venrick; biomass estimation by Smayda]. Additional considerations regarding the methods we have used have been discussed by Kutkuhn, 1958; Lund et al., 1958; and Sicko-Goad et al., 1977.

Results

The results of our sample analyses are provided in Tables 1-52. Table 53 summarizes the total biomass estimates for all samples. Table 54 provides a complete listing, by taxonomic division, of all of the genera and species encountered in our analyses of samples. Finally, Appendix III provides the computer file names (stored at NORDA) which correspond to our samples.

Table 1

SAMPLE NUMBER 1
DATE 5/01/85
TIME 1430 GMT
DEPTH 2m(TUPS)

LOCATION :lat 37 59.75N
:long 72 59.20W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/L$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	2	2.35	4.71
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	5	1.67	8.4
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	1	.0007	0
Rhizosolenia styliformis	4	.06	.23
Skeletonema costatum	46	.013	.58
Stephanopyxis turris			
Synedra sp.	1	.00004	0
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	5	.393	2
Ceratium lineatum			
Ceratium longipes	6	4.68	28.11
Ceratium minutum	7	.124	.87
Ceratium pentagonum			
Ceratium tripos	5	4.357	21.79
Dinophysis caudata	1	2.624	2.62
Dinophysis ovum			
Peridinium depressum	100	.058	5.83
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	2	.0238	.05
MONADS	36	.004	.17

Table 2

SAMPLE NUMBER 2
DATE 5/01/85
TIME 1500 GMT
DEPTH 2m(TUPS)

LOCATION :lat 37 55.68N
:long 72 56.37W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	2	.1635	.33
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	11	1.65	18.16
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	5	.0228	.11
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	5	.3413	1.71
Ceratium lineatum	17	.2543	4.32
Ceratium longipes	5	1.963	9.82
Ceratium minutum	3	.71	2.13
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata	4	.9475	3.8
Dinophysis ovum			
Peridinium depressum	92	.3867	35.6
Prorocentrum micans			
Prorocentrum rostratum	1	.0263	.03
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	26	.005	.13

SAMPLE NUMBER 3
DATE 5/01/85
TIME 2030 GMT
DEPTH 2m(TUPS)

LOCATION :lat 37 59.94N
:long 72 48.95W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	4	2.382	9.53
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	2	1.05	2.1
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.	9	.25	2.25
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.	1	.00011	.0001
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum	2	.2014	.453
Ceratium longipes	5	.2631	1.31
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	37	.0796	2.95
Prorocentrum micans			
Prorocentrum rostratum	1	.06	.06
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	33	.004	.132

SAMPLE NUMBER 4
DATE 5/01/85
TIME 2230 GMT
DEPTH 2m(TUPS)

LOCATION :lat 37 56.16N
:long 72 47.28W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	5	.14578	.73
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	7	.94554	6.62
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	2	.6285	1.26
Ceratium lineatum			
Ceratium longipes	3	3.488	10.5
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	1	1.9625	1.9625
Dinophysis caudata	1	.3886	.39
Dinophysis ovum			
Peridinium depressum	1	1.256	1.26
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum	1	.01	.01
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.263	.263
MONADS	33	.005	.16

SAMPLE NUMBER 5
DATE 5/01/85
TIME 2300 GMT
DEPTH 2m(TUPS)

LOCATION :lat 37 59.94N
:long 72 48.95W
VOLUME FILTERED 80L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	2	1.41	2.82
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	5	.984	4.92
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	1	.0746	.075
Rhizosolenia styliformis			
Skeletonema costatum	19	.0225	.427
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	2	.6285	1.26
Ceratium lineatum	8	.2352	1.9
Ceratium longipes	6	.385	2.31
Ceratium minutum	4	.196	.784
Ceratium pentagonum			
Ceratium tripos	3	2.292	6.87
Dinophysis caudata	1	2.5592	2.56
Dinophysis ovum			
Peridinium depressum	20	.135	2.7
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum	1	.0255	.025
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	28	.004	.12

SAMPLE NUMBER 6
DATE 5/02/85
TIME 0030 GMT
DEPTH 2m(TUPS)

LOCATION :lat 38 10.42N
:long 72 54.63W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	10	1.96	19.62
Corethron hystrix			
Coscinodiscus centralis	20	2.18	43.68
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	618	1.57	963.25
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	7489	.045	374
Stephanopyxis turris			
Synedra sp.	39	.098	3.46
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	135	.625	101.36
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum	330	.243	77.14
Ceratium pentagonum	124	.209	26.61
Ceratium tripos	132	2.55	293.24
Dinophysis caudata	31	1.8	55.85
Dinophysis ovum			
Peridinium depressum	1453	.063	94.64
Prorocentrum micans	10	.04	.4
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	872	.004	3.49

Table 7

SAMPLE NUMBER 7
DATE 5/02/85
TIME 1240 GMT
DEPTH 2m(TUPS)

LOCATION :lat 38 05.21N
:long 72 37.19W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	21	.42	8.81
Corethron hystrix	29	.07	2
Coscinodiscus centralis	128	.33	42.35
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	482	1.3	627.81
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.	10	.04	.4
Navicula sp.	191	.002	.38
Nitzschia seriata	41	.021	.85
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	1687	.03	49.4
Stephanopyxis turris			
Synedra sp.	38	.0033	.13
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	63	2.91	183.22
Ceratium furca			
Ceratium fusus	160	.692	110.67
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum	752	.235	176.43
Ceratium pentagonum	334	.194	64.98
Ceratium tripos	118	4.77	563.24
Dinophysis caudata	18	.494	8.89
Dinophysis ovum			
Peridinium depressum	1132	.076	90.5
Prorocentrum micans	72	.026	1.88
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	18	.011	.197
Distephanus speculum	10	.019	.19
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	165	.019	3.15
MONADS	2375	.004	9.5

SAMPLE NUMBER UPS-N1
DATE 5/10/85
TIME 1630 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 44.93N
:long 71 25.67W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	28	.18	5.11
Corethron hystrix			
Coscinodiscus centralis	46	.31	10.7
Coscinodiscus granii	351	1.05	371.87
Coscinodiscus lineatus			
Guinardia flaccida	749	1.33	999
Hemiaulus hauckii	10	.088	.88
Leptocylindrus danicus	1094	.1	109.4
Lithodesmium undulatum	125	.05	11.09
Melosira sp.	10	.157	1.57
Navicula sp.			
Nitzschia seriata	21	.0052	.11
Pleurosigma sp.			
Rhizosolenia alata	131	.129	17.11
Rhizosolenia setigera	419	.00007	.0315
Rhizosolenia styliformis			
Skeletonema costatum	8	.14	1.12
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	192	1.72	356.23
Ceratium furca			
Ceratium fusus	421	.55	233.48
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	423	.21	89.07
Ceratium tripos	1560	2.23	3479.88
Dinophysis caudata	179	.58	103.8
Dinophysis ovum			
Peridinium depressum	4335	.16	690.14
Prorocentrum micans	678	.0112	7.62
Prorocentrum rostratum	138	.0042	.588
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	4785	.139	719.2
SILICOFLAGELLATES			
Dictyocha fibula	10	.006	.06
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	97	.0142	1.38
MONADS	3144	.004	12.58

SAMPLE NUMBER UPS-N2
DATE 5/10/85
TIME 1645 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 47.05N
:long 71 25.56W
VOLUME SAMPLE
VOLUME FILTERED

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	1	.1759	.176
Corethron hystrix			
Coscinodiscus centralis	2	4.648	9.3
Coscinodiscus granii	5	.5236	2.62
Coscinodiscus lineatus			
Guinardia flaccida	10	1.193	12
Hemiaulus hauckii			
Leptocylindrus danicus	20	.08823	1.8
Lithodesmium undulatum	2	.392	.8
Melosira sp.			
Navicula sp.			
Nitzschia seriata	2	.01166	.02
Pleurosigma sp.	1	.0272	.03
Rhizosolenia alata	4	.0731	.3
Rhizosolenia setigera	16	.00008	0
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides	1	.06	.06
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	1	2.23	2.23
Ceratium furca	2	1.179	2.36
Ceratium fusus	9	.605	5.44
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	9	.229	2.1
Ceratium tripos	28	2.292	64.2
Dinophysis caudata	2	4.71	9.42
Dinophysis ovum			
Peridinium depressum	46	.1662	7.64
Prorocentrum micans	13	.0109	.14
Prorocentrum rostratum	2	.004	.008
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	73	.1386	10.12
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	3	.0142	.04
MONADS	63	.005	.31

Table 10

SAMPLE NUMBER UPS-N3
DATE 5/10/85
TIME 1700 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 49.19N
:long 71 26.16W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	1	.2263	.2263
Corethron hystrix			
Coscinodiscus centralis	1	6.63	6.63
Coscinodiscus granii	4	.5154	2.1
Coscinodiscus lineatus			
Guinardia flaccida	7	1.238	8.7
Hemiaulus hauckii			
Leptocylindrus danicus	14	.08173	1.14
Lithodesmium undulatum	1	.3136	.314
Melosira sp.			
Navicula sp.			
Nitzschia seriata	2	.0077	.01
Pleurosigma sp.	1	.0258	.026
Rhizosolenia alata	2	.0897	.18
Rhizosolenia setigera	12	.00008	0
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	1	2.05	2.05
Ceratium furca	3	1.05	3.15
Ceratium fusus	3	.7085	2.12
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	3	.205	.61
Ceratium tripos	15	2.229	33.44
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	33	.0152	5
Prorocentrum micans	6	.0108	.06
Prorocentrum rostratum	1	.021	.021
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	32	.2303	7.4
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.0142	.014
MONADS	41	.004	.164

SAMPLE NUMBER UPS-N4
DATE 5/10/85
TIME 1730 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 51.36N
:long 71 26.34W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	1	.25	.25
Coscinodiscus granii	6	.255	1.53
Coscinodiscus lineatus			
Guinardia flaccida	19	1.263	24
Hemiaulus hauckii	1	.1697	.17
Leptocylindrus danicus	21	.066	1.4
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	5	.02072	.103
Pleurosigma sp.			
Rhizosolenia alata	1	.1758	.176
Rhizosolenia setigera	9	.00785	.071
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	1	1.925	1.925
Ceratium furca	1	.441	.441
Ceratium fusus	9	.6637	6
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	8	.196	1.6
Ceratium tripos	15	2.292	34.4
Dinophysis caudata	1	.4613	.4613
Dinophysis ovum			
Peridinium depressum	64	.1662	10.64
Prorocentrum micans	10	.0076	.076
Prorocentrum rostratum	2	.004	.008
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	113	.2853	32.24
SILICOFLAGELLATES			
Dictyocha fibula	1	.0056	.0056
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	3	.0142	.043
MONADS	75	.004	.3

Table 12

SAMPLE NUMBER UPS-N5
DATE 5/10/85
TIME 1745 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 54.05N
:long 71 26.46W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	54	.182	4.95
Corethron hystrix			
Coscinodiscus centralis	31	.18	5.58
Coscinodiscus granii	86	.998	128.37
Coscinodiscus lineatus			
Guinardia flaccida	835	1.14	1009.84
Hemiaulus hauckii	21	.866	18.2
Leptocylindrus danicus	966	.095	90.22
Lithodesmium undulatum	39	.0784	3.06
Melosira sp.	10	.471	4.71
Navicula sp.			
Nitzschia seriata	407	.011	4.28
Pleurosigma sp.			
Rhizosolenia alata	209	.08	16.08
Rhizosolenia setigera	320	.0008	2.56
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	115	1.83	205.04
Ceratium furca			
Ceratium fusus	384	.61	234.05
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum	10	.33	3.3
Ceratium pentagonum	470	.21	96.56
Ceratium tripos	505	2.25	1131.9
Dinophysis caudata	167	1.01	200.46
Dinophysis ovum	33	.162	5.35
Peridinium depressum	3338	.12	474.2
Prorocentrum micans	454	.01	4.52
Prorocentrum rostratum	108	.007	.96
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	10708	.205	2147.39
SILICOFLAGELLATES			
Dictyocha fibula	66	.009	.47
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	38	.0142	.54
MONADS	4303	.004	17.212

SAMPLE NUMBER UPS-N6
DATE 5/10/85
TIME 1802 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 58.85N
:long 71 26.51W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	140	.2875	40.25
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	40	.196	7.85
Hemiaulus hauckii			
Leptocylindrus danicus	60	.071	4.24
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	420	.00471	2
Rhizosolenia alata			
Rhizosolenia setigera	720	.00008	.06
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides	120	.0032	2.28
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	20	.0653	1.31
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	440	.00684	3.01
Prorocentrum micans	20	.0094	.19
Prorocentrum rostratum	100	.00415	.42
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	1100	.2241	246.51
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	3500	.004	14

SAMPLE NUMBER UPS-N7
DATE 5/11/85
TIME 1800 GMT
DEPTH 2m(TUPS)

LOCATION :lat 39 58.53N
:long 71 26.53W
VOLUME FILTERED 50L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	3	.17	.51
Chaetoceros decipiens	12	.2875	3.45
Corethron hystrix			
Coscinodiscus centralis	1	.396	.4
Coscinodiscus granii	3	.4482	1.34
Coscinodiscus lineatus			
Guinardia flaccida	2	1.115	2.22
Hemiaulus hauckii			
Leptocylindrus danicus	1	.071	.071
Lithodesmium undulatum	1	.098	.1
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata	1	.16	.16
Rhizosolenia setigera	5	.0001	.0005
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	2	1.96	3.92
Ceratium furca			
Ceratium fusus	1	1.09	1.09
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	1	.0653	.0653
Ceratium tripos	8	2.29	18.32
Dinophysis caudata	1	.864	.864
Dinophysis ovum			
Peridinium depressum	20	.4015	8.03
Prorocentrum micans	2	.0125	.025
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	55	.1385	7.62
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.0142	.014
MONADS	45	.004	.18

Table 15

SAMPLE NUMBER UPS-N8
DATE 5/11/85
TIME 1820 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 01.58N
:long 71 26.23W
VOLUME FILTERED 50L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	2	.4874	1
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	2	.148	.296
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	3	.00471	.014
Rhizosolenia alata			
Rhizosolenia setigera	2	.00008	.00016
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	3	2.29	6.87
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	4	.319	1.28
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	3	.0653	.2
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	2	.0158	.032
MONADS	28	.004	.112

SAMPLE NUMBER UPS-N9
DATE 5/10/85
TIME 1840 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 04.62N
:long 71 25.76W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	2	.2043	.41
Chaetoceros decipiens	8	.3246	2.6
Corethron hystrix			
Coscinodiscus centralis	1	.208	.21
Coscinodiscus granii	4	.006	.025
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum	1	.078	.08
Melosira sp.			
Navicula sp.			
Nitzschia seriata	1	.0104	.01
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	2	1.925	3.85
Ceratium furca			
Ceratium fusus	2	.826	1.65
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	5	2.16	10.8
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	2	.156	.31
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	6	.356	2.14
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.142	.14
MONADS	19	.005	.1

Table 17

SAMPLE NUMBER UPS-N10
DATE 5/10/85
TIME 1855 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 06.87N
:long 71 25.60W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	1	.153	.153
Corethron hystrix	1	.094	.094
Coscinodiscus centralis	2	3.14	6.28
Coscinodiscus granii	4	.121	.484
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	2	1.089	2.2
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	1	.215	.22
Ceratium tripos	4	2.21	8.84
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	1	.218	.218
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	4	.227	.91
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	3	.0142	.043
MONADS	50	.005	.025

Table 18

SAMPLE NUMBER UPS-S1
DATE 5/10/85
TIME 1930 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 10.74N
:long 71 24.64W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	1	.219	.22
Chaetoceros decipiens	22	.357	7.9
Corethron hystrix			
Coscinodiscus centralis	1	2.93	2.93
Coscinodiscus granii	3	.699	2.1
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum	3	.08	.24
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata	1	.146	.15
Rhizosolenia setigera	1	.000078	.000078
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	1	.628	.63
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	3	2.17	6.5
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	5	.49	2.45
Prorocentrum micans			
Prorocentrum rostratum	1	.004	.004
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	9	.248	2.2
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.104	.104
MONADS	44	.005	.22

SAMPLE NUMBER UPS-S2
DATE 5/10/85
TIME 2030 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 02.62N
:long 71 19.45W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	2	.205	.41
Chaetoceros decipiens	10	.337	3.4
Corethron hystrix			
Coscinodiscus centralis	1	.18	.18
Coscinodiscus granii	2	.237	.47
Coscinodiscus lineatus			
Guinardia flaccida	1	.973	.973
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	1	.015	.015
Pleurosigma sp.			
Rhizosolenia alata	1	.134	.134
Rhizosolenia setigera	7	.000078	.00055
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	2	1.66	3.34
Ceratium furca			
Ceratium fusus	1	.704	.704
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	7	2.104	14.73
Dinophysis caudata	1	.699	.7
Dinophysis ovum			
Peridinium depressum	5	.156	.8
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	66	.5236	34.6
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	53	.005	.26

Table 20

SAMPLE NUMBER UPS-S3
DATE 5/10/85
TIME 2050 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 00.17N
:long 71 17.87W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	1	.03535	.03535
Chaetoceros decipiens	1	.0735	.0735
Corethron hystrix			
Coscinodiscus centralis	1	7.33	7.33
Coscinodiscus granii	3	.38	1.14
Coscinodiscus lineatus			
Guinardia flaccida	28	1.22	34.2
Hemiaulus hauckii			
Leptocylindrus danicus	25	.0616	1.54
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	3	.0103	.03
Pleurosigma sp.	6	.000054	.00032
Rhizosolenia alata	2	.1012	.2
Rhizosolenia setigera	4	.008	.03
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	5	.4965	2.5
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	4	.198	.8
Ceratium tripos	13	2.29	29.8
Dinophysis caudata	1	3.14	3.14
Dinophysis ovum			
Peridinium depressum	46	.1564	7.2
Prorocentrum micans	10	.0086	.086
Prorocentrum rostratum	1	.0041	.0041
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	119	.1936	23
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.018	.018
MONADS	63	.005	.315

Table 21

SAMPLE NUMBER UPS-S4
DATE 5/11/85
TIME 0142 GMT
DEPTH 2m(TUPS)

LOCATION :lat 40 05.39N
:long 71 07.79W
VOLUME FILTERED 40L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	1	.03535	.03535
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	1	.916	.916
Hemiaulus hauckii			
Leptocylindrus danicus	2	.0601	.12
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	6	.000054	.00032
Rhizosolenia alata			
Rhizosolenia setigera	7	.0000785	.00055
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	1	2.35	2.35
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	1	.18	.18
Prorocentrum micans	2	.006	.012
Prorocentrum rostratum	1	.0041	.0041
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	8	.1386	1.11
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1	.0142	.0142
MONADS	44	.005	.22

Table 22

SAMPLE NUMBER 5-1
DATE 5/02/85
TIME 1700 GMT
DEPTH 15m

LOCATION :lat 38 20.9N
:long 72 42.4W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	1650	.0318	52.5
Corethron hystrix			
Coscinodiscus centralis	2255	.049	94.77
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	5499	1.77	10779.59
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.	3300	.003	9.4
Nitzschia seriata	55864	.0043	184.97
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	101393	.0003	25.51
Rhizosolenia styliformis	825	.0942	77.71
Skeletonema costatum	156048	.083	3203.88
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	605	.495	299.41
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	4289	.2481	1064.35
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	68676	.039	2950.74
Prorocentrum micans	1210	.006	7.3
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	6379	.089	222.6
MONADS	162481	.005	812.32

SAMPLE NUMBER 5-2
DATE 5/02/85
TIME 1700 GMT
DEPTH 25m

LOCATION :lat 38 20.9N
:long 72 42.4W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	2035	.025	46.26
Corethron hystrix			
Coscinodiscus centralis	3299	.151	497.49
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	10172	1.65	16743.8
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.	1650	.0065	10.74
Nitzschia seriata	108045	.0098	1475.3
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	42612	.006	386.26
Rhizosolenia styliformis	3849	.044	98.46
Skeletonema costatum	121735	.03	3619
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	2419	.206	497.83
Ceratium tripos	825	3.14	2590
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	330020	.0136	4329.76
Prorocentrum micans	10447	.007	74.17
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	2255	.0096	23.15
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	825	.0142	11.71
MONADS	292244	.0002	46.76

Table 24

SAMPLE NUMBER 6-1
DATE 5/02/85
TIME 2215 GMT
DEPTH 25m

LOCATION :lat 38 05.3N
:long 72 31.3W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	120	.60423	72.5
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus	20	.3535	7.07
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	120	.0441	5.3
Pleurosigma sp.	40	.08375	3.35
Rhizosolenia alata	140	.0219	3.06
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	540	.2173	117.34
Prorocentrum micans			
Prorocentrum rostratum	120	.0141	1.7
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	4620	.0158	72.8
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	220	.077	17
MONADS	2400	.005	12

SAMPLE NUMBER 6-2
DATE 5/02/85
TIME 2215 GMT
DEPTH 35m

LOCATION :lat 38 05.3N
:long 72 31.3W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	20	.0462	.924
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix	40	.2324	9.3
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	40	.6874	27.5
Hemiaulus hauckii			
Leptocylindrus danicus	60	.233	14
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.	140	.073	10.22
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	80	.06285	5.03
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	**6320**	**.0118**	**74.64**
Prorocentrum micans			
Prorocentrum rostratum	20	.0415	.83
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	20	.0142	.28
MONADS	5700	.005	28.5

Table 26

SAMPLE NUMBER 7-1
DATE 5/03/85
TIME 0148 GMT
DEPTH 12m

LOCATION :lat 38 09.12N
:long 72 32.69W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	40	.00785	.31
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	20	.0653	1.31
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	240	.052	12.5
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	8700	.0131	113.82
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	200	.0318	6.4
MONADS	12000	.005	60

SAMPLE NUMBER 7-2
DATE 5/03/85
TIME 0058 GMT
DEPTH 31.8m

LOCATION :lat 38 09.12N
:long 72 32.69W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	20	.0157	.314
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	60	.05535	3.32
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	240	22.24	5337
Coscinodiscus lineatus			
Guinardia flaccida	380	15.49	5886
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis	160	01815	3
Skeletonema costatum			
Stephanopyxis turris	100	.0976	9.76
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	20	8.835	176.7
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	2680	.0455	122
Prorocentrum micans			
Prorocentrum rostratum	180	.0106	1.91
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	12500	.032	395.9
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	640	.0668	39.5
MONADS	3200	.005	16

SAMPLE NUMBER 8-1
DATE 5/05/85
TIME 1550 GMT
DEPTH 32m

LOCATION :lat 38 01.34N
:long 72 43.08W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	6700	.1921	1287
Corethron hystrix			
Coscinodiscus centralis	20	.0653	1.31
Coscinodiscus granii	20	33.512	670.24
Coscinodiscus lineatus			
Guinardia flaccida	20	25.12	502.4
Hemiaulus hauckii			
Leptocylindrus danicus	7300	.11965	873.42
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	480	.036	17.35
Rhizosolenia alata	180	.00733	1.32
Rhizosolenia setigera			
Rhizosolenia styliformis	40	.3771	15
Skeletonema costatum	100	.05	5
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	40	7.065	282.6
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	40	2.355	94.2
Ceratium tripos	20	25.12	502.4
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	700	.0876	61.4
Prorocentrum micans			
Prorocentrum rostratum	300	.0143	4.3
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	80	.055	4.4
SILICOFLAGELLATES			
Dictyocha fibula	60	.03	1.8
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	40	.0142	.6
MONADS	3000	.005	15

Table 29

SAMPLE NUMBER 8-1-1
DATE 5/05/85
TIME 1402 GMT
DEPTH 30m

LOCATION :lat 38 00.69N
:long 72 50.22W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	4780	.204	974.35
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	60	19.252	1155
Coscinodiscus lineatus			
Guinardia flaccida	180	18.317	3297
Hemiaulus hauckii			
Leptocylindrus danicus	7420	.222	1645.32
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.	40	.0142	.57
Nitzschia seriata	240	.006	1.6
Pleurosigma sp.	280	.006	1.76
Rhizosolenia alata	200	.009	1.89
Rhizosolenia setigera			
Rhizosolenia styliformis	20	.377	7.54
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	80	7.33	586.13
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	260	3.95	1025.67
Ceratium tripos	40	43.69	1747.64
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	1680	.1134	190.54
Prorocentrum micans			
Prorocentrum rostratum	160	.018	3
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	1140	.0019	2.14
SILICOFLAGELLATES			
Dictyocha fibula	60	.237	14.25
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	120	.057	6.88
MONADS	4100	.005	20.5

Table 30

SAMPLE NUMBER 10-1
DATE 5/05/85
TIME 2250 GMT
DEPTH 5.6m

LOCATION :lat 37 55.89N
:long 72 51.39W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	460	.111	51.1
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	20	14.14	282.8
Coscinodiscus lineatus			
Guinardia flaccida	140	13.82	1934.24
Hemiaulus hauckii			
Leptocylindrus danicus	3240	.396	1283.83
Lithodesmium undulatum			
Melosira sp.	40	.09	3.6
Navicula sp.			
Nitzschia seriata	540	.028	15
Pleurosigma sp.	180	.078	2.82
Rhizosolenia alata	160	.016	2.5
Rhizosolenia setigera			
Rhizosolenia styliformis	40	.406	16.3
Skeletonema costatum	600	.122	73.5
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	20	1.96	39.2
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	120	1.36	163.72
Ceratium tripos	40	11.38	455.4
Dinophysis caudata	20	11.66	233.24
Dinophysis ovum			
Peridinium depressum	4900	.082	403.7
Prorocentrum micans			
Prorocentrum rostratum	940	.05	47.2
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	1720	.004	8.3
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	420	.072	30.1
MONADS	2500	.005	12.5

SAMPLE NUMBER 10-2
DATE 5/05/85
TIME 2250 GMT
DEPTH 30m

LOCATION :lat 37 55.89N
:long 72 51.39W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	760	.065	49.5
Corethron hystrix			
Coscinodiscus centralis	20	.0653	1.31
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	280	1.4	392.5
Hemiaulus hauckii			
Leptocylindrus danicus	4120	1.34	550.53
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	180	.36	6.42
Pleurosigma sp.	100	.008	.84
Rhizosolenia alata	140	.005	.7
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	1900	.0137	26
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi	20	.025	.5
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	60	.542	32.5
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	500	.198	99
Ceratium tripos	40	2.355	94.2
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	6400	.019	122.5
Prorocentrum micans	1040	.008	9
Prorocentrum rostratum	160	.007	1.12
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	100	.00745	.745
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	120	.3123	3.75
MONADS	3000	.005	15

SAMPLE NUMBER 11-1
DATE 5/09/85
TIME 1209 GMT
DEPTH 2m

LOCATION :lat 39 52.18N
:long 70 27.64W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	20	.0141	.283
Chaetoceros atlanticum			
Chaetoceros breve	560	.026	14.5
Chaetoceros decipiens	60	.425	25.5
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	300	1.12	336
Hemiaulus hauckii	280	.098	27.33
Leptocylindrus danicus	3300	.0142	47
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	360	.0052	1.86
Pleurosigma sp.	40	.0071	.28
Rhizosolenia alata			
Rhizosolenia setigera	1340	.008	10.43
Rhizosolenia styliformis	540	.131	70.69
Skeletonema costatum	60	.4945	10
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	20	2.355	47.1
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	80	.18	14.4
Prorocentrum micans	80	.009	.75
Prorocentrum rostratum	40	.006	.24
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	260	.2063	53.64
SILICOFLAGELLATES			
Dictyocha fibula	200	.011	2.29
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	20	.0142	.28
MONADS	3900	.005	19.5

Table 33

SAMPLE NUMBER 11-2
DATE 5/09/85
TIME 1209 GMT
DEPTH 18m

LOCATION :lat 39 52.18N
:long 70 27.64W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	600	.0166	10
Chaetoceros decipiens	120	1.42	170.5
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	240	1.19	285
Hemiaulus hauckii	120	.077	9.33
Leptocylindrus danicus	4160	.688	114
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	620	.052	32.1
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	1740	.007	12.84
Rhizosolenia styliformis			
Skeletonema costatum	100	.0542	5.42
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	20	.196	3.92
Ceratium tripos	20	1.57	31.4
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	140	.229	32
Prorocentrum micans	100	.009	.9
Prorocentrum rostratum	80	.006	.48
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	260	.242	62.81
SILICOFLAGELLATES			
Dictyocha fibula	60	.007	.43
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	5000	.005	25

Table 34

SAMPLE NUMBER 12-1
DATE 5/09/85
TIME 1440 GMT
DEPTH 1m

LOCATION :lat 40 00.00N
:long 70 30.98W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	180	.018	3.33
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	240	1.12	268
Hemiaulus hauckii			
Leptocylindrus danicus	1800	.027	48
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	340	.0052	1.76
Pleurosigma sp.	40	.023	.92
Rhizosolenia alata	80	.371	29.7
Rhizosolenia setigera			
Rhizosolenia styliformis	340	.099	34
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi	40	.028	1.12
DINOFLAGELLATES			
Ceratium contortum	20	2.31	46.2
Ceratium furca			
Ceratium fusus	80	.8485	67.88
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	100	.196	19.6
Ceratium tripos	100	2.09	209
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	280	.164	45.81
Prorocentrum micans	460	.078	3.6
Prorocentrum rostratum	240	.006	1.44
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	4180	.067	279.3
SILICOFLAGELLATES			
Dictyocha fibula	20	.031	.62
Distephanus speculum	20	.031	.62
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	60	.0142	.85
MONADS	3500	.005	17.5

Table 35

SAMPLE NUMBER 12-2
DATE 5/09/85
TIME 1440 GMT
DEPTH 12m

LOCATION :lat 40 00.00N
:long 70 30.98W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	20	.0118	.24
Chaetoceros atlanticum	20	3.063	61.26
Chaetoceros breve			
Chaetoceros decipiens	100	.058	5.8
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	280	1.626	455.3
Hemiaulus hauckii	20	.3	6
Leptocylindrus danicus	480	.258	123.8
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata	360	.05	18
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	40	.039	1.6
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	40	.4242	17
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	200	.196	39.2
Ceratium tripos	20	2.355	47.1
Dinophysis caudata			
Dinophysis ovum	20	.0653	1.31
Peridinium depressum	4100	.028	115.77
Prorocentrum micans	320	.006	2
Prorocentrum rostratum	240	.007	1.68
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	120	.007	.83
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	140	.0115	1.6
MONADS	4800	.005	24

SAMPLE NUMBER 12-3
DATE 5/09/85
TIME 1440 GMT
DEPTH 18m

LOCATION :lat 40 00.00N
:long 70 30.98W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	580	.111	64.2
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	280	1.31	366.3
Hemiaulus hauckii			
Leptocylindrus danicus	360	.2525	90.9
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	80	.03	2.4
Pleurosigma sp.	20	.015	.3
Rhizosolenia alata	580	.045	26.1
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	320	.028	8.9
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	40	1.73	69.3
Ceratium furca			
Ceratium fusus	60	.47	28.3
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum	20	.5656	11.3
Ceratium pentagonum	60	.196	11.8
Ceratium tripos	60	2.62	157
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	2900	.021	59.7
Prorocentrum micans	420	.008	3.5
Prorocentrum rostratum	160	.006	.96
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	60	.009	.2
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.			
MONADS	4300	.005	21.5

Table 37

SAMPLE NUMBER 12-4
DATE 5/09/85
TIME 1440 GMT
DEPTH 25m

LOCATION :lat 40 00.00N
:long 70 30.98W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	180	.094	17
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	160	1.86	298.3
Hemiaulus hauckii			
Leptocylindrus danicus	320	.237	75.8
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	60	.009	.54
Pleurosigma sp.			
Rhizosolenia alata	180	.054	9.72
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	80	.019	1.6
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	60	.4713	28.3
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	160	.196	31.4
Ceratium tripos	40	2.355	94.2
Dinophysis caudata	20	4.76	95.2
Dinophysis ovum			
Peridinium depressum	4540	.019	86.5
Prorocentrum micans	320	.007	2.25
Prorocentrum rostratum	160	.006	.96
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	20	.006	.12
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	40	.005	.2
MONADS	4400	.005	22

SAMPLE NUMBER 13-1
DATE 5/09/85
TIME 1725 GMT
DEPTH 15m

LOCATION :lat 40 04.04N
:long 70 34.22W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	20	.0314	.628
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix	20	.196	4
Coscinodiscus centralis			
Coscinodiscus granii	20	1.767	35.34
Coscinodiscus lineatus			
Guinardia flaccida	240	1.34	321.85
Hemiaulus hauckii			
Leptocylindrus danicus	60	.047	2.8
Lithodesmium undulatum			
Melosira sp.	20	.157	3.14
Navicula sp.	860	.007	6.75
Nitzschia seriata			
Pleurosigma sp.	400	.006	2.4
Rhizosolenia alata	180	.006	1.08
Rhizosolenia setigera			
Rhizosolenia styliformis	920	.021	19
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	40	1.925	77
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	20	.294	5.9
Ceratium tripos	40	2.159	86.35
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	3060	.0146	44.6
Prorocentrum micans	100	.01	1
Prorocentrum rostratum	20	.007	.14
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	440	.005	2.2
MONADS	7500	.005	37.5

Table 39

SAMPLE NUMBER 13-2
DATE 5/9/85
TIME 1725 GMT
DEPTH 25m

LOCATION :lat 40 04.04N
:long 70 34.22W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	20	.4	8
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	40	.98	39.2
Corethron hystrix	20	.196	4
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus	80	.36	28.14
Guinardia flaccida	340	1.75	596.6
Hemiaulus hauckii			
Leptocylindrus danicus	80	.062	5
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	400	.0155	6.2
Rhizosolenia alata	1100	.005	5.5
Rhizosolenia setigera			
Rhizosolenia styliformis	740	.008	6
Skeletonema costatum	20	.022	.44
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	20	1.925	38.5
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	20	.196	4
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	2900	.014	40
Prorocentrum micans	140	.01	1.4
Prorocentrum rostratum	20	.006	.12
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	20	.006	.12
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	240	.015	3.6
MONADS	5500	.005	27.5

SAMPLE NUMBER 14-1
DATE 5/09/85
TIME 1940 GMT
DEPTH 11m

LOCATION :lat 40 20.85N
:long 70 40.34W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	40	.98	39.2
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	80	.027	2.16
Prorocentrum micans	20	.009	.18
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	20	.0142	.28
MONADS	10000	.005	50

Table 41

SAMPLE NUMBER 15-1
DATE 5/11/85
TIME 1610 GMT
DEPTH 23m

LOCATION :lat 40 09.31N
:long 71 40.51W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve	20	.2514	5
Chaetoceros decipiens	20	.98	19.6
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	20	.005	.1
Rhizosolenia alata	20	.007	.14
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	20	1.925	38.5
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	20	1.155	23.1
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	20	.0142	.28
Prorocentrum micans			
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1500	.0132	19.8
MONADS	8000	.005	40

Table 42

SAMPLE NUMBER 15-2
DATE 5/11/85
TIME 1610 GMT
DEPTH 30m

LOCATION :lat 40 09.31N
:long 71 40.51W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix	20	.1257	2.5
Coscinodiscus centralis			
Coscinodiscus granii	100	.088	8.8
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.	100	.0142	1.42
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis	20	.007	.14
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum	20	.18	3.6
Peridinium depressum	40	.009	.36
Prorocentrum micans	80	.008	.64
Prorocentrum rostratum			
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	340	.015	5.14
MONADS	3400	.005	17

SAMPLE NUMBER 16-1
DATE 5/11/85
TIME 1925 GMT
DEPTH 11m

LOCATION :lat 39 56.27N
:long 71 34.25W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	100	.8624	86.24
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	20	.1131	2.3
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus			
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	120	.125	15
Prorocentrum micans			
Prorocentrum rostratum	20	.012	.24
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1300	.0123	16
MONADS	4000	.005	20

Table 44

SAMPLE NUMBER 16-2
DATE 5/11/85
TIME 1925 GMT
DEPTH 19m

LOCATION :lat 39 56.27N
:long 71 34.25W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	60	1.01	61
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida			
Hemiaulus hauckii			
Leptocylindrus danicus	160	.22	35
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata			
Pleurosigma sp.	100	.0051	.51
Rhizosolenia alata	280	.006	1.68
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum	20	.0471	1
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos	20	2.355	47.1
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	1700	.0142	24.14
Prorocentrum micans	80	.009	.72
Prorocentrum rostratum	120	.007	.84
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	1480	.017	25.3
MONADS	8000	.005	40

Table 45

SAMPLE NUMBER 16-3
DATE 5/11/85
TIME 1925 GMT
DEPTH 25m

LOCATION :lat 39 56.27N
:long 71 34.25W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	40	.006	.24
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	40	.2156	8.6
Corethron hystrix	20	.071	1.4
Coscinodiscus centralis			
Coscinodiscus granii	20	.0335	.7
Coscinodiscus lineatus			
Guinardia flaccida	40	.294	11.8
Hemiaulus hauckii			
Leptocylindrus danicus	80	.291	23.3
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.	20	.007	.14
Nitzschia seriata			
Pleurosigma sp.			
Rhizosolenia alata	220	.007	1.54
Rhizosolenia setigera	20	.471	9.42
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	80	.196	15.7
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	2860	.018	52.3
Prorocentrum micans	220	.008	1.76
Prorocentrum rostratum	220	.008	1.76
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	20	.009	.18
Distephanus speculum	20	.006	.12
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	880	.0122	10.74
MONADS	5400	.005	27

Table 46

SAMPLE NUMBER 17-1
DATE 5/11/85
TIME 2200 GMT
DEPTH 12.5m

LOCATION :lat 39 50.57N
:long 71 32.08W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	40	.006	.24
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	80	.0424	3.4
Corethron hystrix			
Coscinodscus centralis			
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	360	1.31	471
Hemiaulus hauckii			
Leptocylindrus danicus	740	.181	134.3
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	60	.017	1
Pleurosigma sp.	20	.007	.14
Rhizosolenia alata	20	.091	1.83
Rhizosolenia setigera	160	.009	1.44
Rhizosolenia styliformis			
Skeletonema costatum	60	.058	3.45
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	80	.722	57.8
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	40	.196	7.84
Ceratium tripos	60	2.355	141.3
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	6060	.019	120.2
Prorocentrum micans	400	.009	3.6
Prorocentrum rostratum	300	.007	2.1
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula	20	.005	.1
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	520	.013	7
MONADS	8800	.005	44

Table 47

SAMPLE NUMBER 17-2
DATE 5/11/85
TIME 2200 GMT
DEPTH 20m

LOCATION :lat 39 50.57N
:long 71 32.08W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	60	.012	.71
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	900	.048	43.2
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	60	.31	18.6
Coscinodiscus lineatus			
Guinardia flaccida	1020	20.02	1361
Hemiaulus hauckii	180	.143	25.87
Leptocylindrus danicus	2080	.185	386
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	840	.005	4.35
Pleurosigma sp.			
Rhizosolenia alata			
Rhizosolenia setigera	1780	.009	16.02
Rhizosolenia styliformis	700	.278	195
Skeletonema costatum	140	.659	13
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	20	1.925	38.5
Ceratium furca			
Ceratium fusus	40	.4242	17
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	160	.211	33.71
Ceratium tripos	40	2.74	110
Dinophysis caudata	20	1.55	31.09
Dinophysis ovum			
Peridinium depressum	5720	.0211	120.71
Prorocentrum micans	1380	.008	11.7
Prorocentrum rostratum	560	.006	3.36
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi			
SILICOFLAGELLATES			
Dictyocha fibula			
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	520	.0141	7.34
MONADS	7400	.005	37

SAMPLE NUMBER 17-3
DATE 5/11/85
TIME 2200 GMT
DEPTH 30m

LOCATION :lat 39 50.57N
:long 71 32.08W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	60	.005	.3
Chaetoceros atlanticum			
Chaetoceros breve	20	.3535	7.1
Chaetoceros decipiens	400	.041	16.4
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	120	.141	17
Coscinodiscus lineatus			
Guinardia flaccida	460	1.65	760.32
Hemiaulus hauckii	20	.085	1.7
Leptocylindrus danicus	880	.102	89.7
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	120	.015	1.8
Pleurosigma sp.	20	.015	.3
Rhizosolenia alata	20	.011	.21
Rhizosolenia setigera	220	.008	1.76
Rhizosolenia styliformis			
Skeletonema costatum	80	.0942	7.54
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	60	.6285	37.7
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	200	.206	41.2
Ceratium tripos	60	2.22	133.45
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	1700	.048	81.4
Prorocentrum micans	1620	.009	15.1
Prorocentrum rostratum	620	.007	4.34
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	10900	.023	249.35
SILICOFLAGELLATES			
Dictyocha fibula	100	.009	.9
Distephanus speculum	20	.005	.11
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	660	.011	7.3
MONADS	8200	.005	41

Table 49

SAMPLE NUMBER 23-1
DATE 5/12/85
TIME 1350 GMT
DEPTH 10m

LOCATION :lat 39 38.49N
:long 71 26.51W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis	20	.18	3.6
Coscinodiscus granii			
Coscinodiscus lineatus			
Guinardia flaccida	360	1.48	533.8
Hemiaulus hauckii			
Leptocylindrus danicus	200	.219	43.83
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	100	.012	1.2
Pleurosigma sp.	40	.022	.88
Rhizosolenia alata			
Rhizosolenia setigera	120	.008	.96
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	20	1.155	23.1
Ceratium furca			
Ceratium fusus	140	.539	75.42
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum			
Ceratium tripos			
Dinophysis caudata	20	.216	4.32
Dinophysis ovum			
Peridinium depressum	4160	.0264	110.1
Prorocentrum micans	200	.008	1.6
Prorocentrum rostratum	1180	.006	7.08
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	13240	.0142	188
SILICOFLAGELLATES			
Dictyocha fibula	120	.028	3.36
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	320	.01452	4.65
MONADS	5800	.005	29

SAMPLE NUMBER 23-2
DATE 5/12/85
TIME 1350 GMT
DEPTH 16m

LOCATION :lat 39 38.49N
:long 71 26.51W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens			
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	80	.0653	5.22
Coscinodiscus lineatus			
Guinardia flaccida	280	1.32	369
Hemiaulus hauckii			
Leptocylindrus danicus	100	.2404	24.04
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	80	.021	1.68
Pleurosigma sp.	20	.023	.46
Rhizosolenia alata			
Rhizosolenia setigera			
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus	20	.3535	7.1
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	20	.196	4
Ceratium tripos			
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	700	.099	69.55
Prorocentrum micans	680	.008	5.44
Prorocentrum rostratum	300	.013	3.9
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	11100	.012	133.2
SILICOFLAGELLATES			
Dictyocha fibula	20	.006	.12
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	200	.0142	2.84
MONADS	5300	.005	26.5

SAMPLE NUMBER 23-3
DATE 5/12/85
TIME 1350 GMT
DEPTH 25m

LOCATION :lat 39 38.49N
:long 71 26.51W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum			
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	60	.3535	21.21
Corethron hystrix			
Coscinodiscus centralis	20	4.189	83.8
Coscinodiscus granii	140	.311	43.54
Coscinodiscus lineatus			
Guinardia flaccida	1020	1.36	1387.9
Hemiaulus hauckii			
Leptocylindrus danicus	580	.184	106.62
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	300	.0155	4.7
Pleurosigma sp.	40	.042	1.68
Rhizosolenia alata	240	.396	95.04
Rhizosolenia setigera	280	.006	1.68
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum	40	3.53	141.3
Ceratium furca			
Ceratium fusus	40	.318	12.73
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	140	.2016	28.22
Ceratium tripos	140	1.96	274.4
Dinophysis caudata			
Dinophysis ovum			
Peridinium depressum	2400	.599	1438.75
Prorocentrum micans	1600	.009	14.4
Prorocentrum rostratum	320	.012	4
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	14600	.014	204.4
SILICOFLAGELLATES			
Dictyocha fibula	140	.01	1.4
Distephanus speculum			
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	160	.0142	2.3
MONADS	12000	.005	60

SAMPLE NUMBER 23-4
DATE 5/12/85
TIME 1350 GMT
DEPTH 33m

LOCATION :lat 39 38.49N
:long 71 26.15W
VOLUME FILTERED 0.5L
SAMPLE VOLUME 50ml

	NUMBER OF CELLS/L	AVERAGE CELL SIZE $mm^3 \times 10^{-6}$	BIOMASS ESTIMATE $mm^3 \times 10^{-6}/\ell$
DIATOMS			
Bacteriastrum delicatulum	100	.031	3.1
Chaetoceros atlanticum			
Chaetoceros breve			
Chaetoceros decipiens	60	.3535	21.21
Corethron hystrix			
Coscinodiscus centralis			
Coscinodiscus granii	60	.6325	38
Coscinodiscus lineatus			
Guinardia flaccida	1280	1.41	1800
Hemiaulus hauckii			
Leptocylindrus danicus	220	.2153	47.4
Lithodesmium undulatum			
Melosira sp.			
Navicula sp.			
Nitzschia seriata	20	.031	.62
Pleurosigma sp.			
Rhizosolenia alata	80	.026	2.08
Rhizosolenia setigera	80	.08	6.4
Rhizosolenia styliformis			
Skeletonema costatum			
Stephanopyxis turris			
Synedra sp.			
Thalassionema nitzschoides			
Thalassiothrix frauenfeldi			
DINOFLAGELLATES			
Ceratium contortum			
Ceratium furca			
Ceratium fusus			
Ceratium lineatum			
Ceratium longipes			
Ceratium minutum			
Ceratium pentagonum	60	.21	12.6
Ceratium tripos	100	3.415	341.5
Dinophysis caudata	20	.66	13.2
Dinophysis ovum	20	.031	.62
Peridinium depressum	1100	.163	179.3
Prorocentrum micans	220	.008	1.76
Prorocentrum rostratum	3200	.006	19.2
Prorocentrum triangulatum			
COCCOLITHOPHORES			
Coccolithus huxleyi	17700	.014	244.25
SILICOFLAGELLATES			
Dictyocha fibula	40	.007	.28
Distephanus speculum	20	.009	.18
MISCELLANEOUS PHYTOPLANKTON			
Cryptomonas sp.	20	.0142	.284
MONADS	9500	.005	47.5

Table 53

TOTAL BIOMASS ESTIMATE ($mm^3 \times 10^{-6}/\ell$)

FOR EACH SAMPLE

SAMPLE #	BIOMASS ESTIMATE	SAMPLE #	BIOMASS ESTIMATE
1	76.58	7-2	11975.90
2	76.03	8-1	4339.70
3	18.70	8-1-1	14234.58
4	23.48	10-1	5159.60
5	26.60	10-2	1456.80
6	2047.60	11-1	666.30
7	2021.25	11-2	1344.10
UPS-N1	7209.69	12-1	1065.15
UPS-N2	130.66	12-2	883.30
UPS-N3	66.45	12-3	897.20
UPS-N4	115.47	12-4	756.10
UPS-N5	5808.98	13-1	648.80
UPS-N6	325.36	13-2	810.90
UPS-N7	47.85	14-1	91.90
UPS-N8	12.63	15-1	107.70
UPS-N9	22.10	15-2	39.80
UPS-N10	15.04	16-1	139.70
UPS-S1	37.06	16-2	202.30
UPS-S2	60.70	16-3	163.40
UPS-S3	104.00	17-1	1001.95
UPS-S4	4.94	17-2	2471.16
5-1	19870.69	17-3	1513.90
5-2	29307.98	23-1	1027.70
6-1	313.40	23-2	657.38
6-2	158.24	23-3	3925.30
7-1	194.30	23-4	2809.79

Table 54

SPECIES LIST

Bacillariophyta; Bacillariophyceae (Diatoms)
- Bacteriastrum delicatulum Cleve
- Chaetoceros atlanticum Cleve
- Chaetoceros breve Schutt
- Chaetoceros decipiens Cleve
- Corethron hystrix Hensen
- Coscinodiscus centralis Ehrenberg
- Coscinodiscus granii Gough
- Coscinodiscus lineatus Ehrenberg
- Guinardia flaccida (Castracane) H. Peragallo
- Gyrosigma sp. Hassall
- Hemiaulus hauckii Grunow
- Leptocylindrus danicus Cleve
- Lithodesmium undulatum Ehrenberg
- Melosira sp. Agardh
- Navicula sp. Bory
- Nitzschia seriata Cleve
- Pleurosigma sp. W. Smith
- Rhizosolenia alata Brightwell
- Rhizosolenia setigera Brightwell
- Rhizosolenia styliformis Brightwell
- Skeletonema costatum (Greville) Cleve
- Stephanopyxis turris (Greville) Ralfs
- Synedra sp. Ehrenberg
- Thalassionema nitzschioides Grunow
- Thalassiosira nordenskioeldi Cleve
- Thalassiothrix frauenfeldi Grunow

Pyrrhophyta; Dinophyceae (Dinoflagellates)
- Ceratium contortum (Gourret) Cleve
- Ceratium furca (Ehrenberg) Cleve
- Ceratium fusus (Ehrenberg) Clap and Swenzy
- Ceratium lineatum (Ehrenberg) Cleve
- Ceratium longipes (Bailey) Gran
- Ceratium minutum Jorgensen
- Ceratium pentagonum Gourret
- Ceratium tripos O. F. Muller
- Dinophysis caudata Kent
- Dinophysis ovum Schutt
- Peridinium depressum Bailey
- Prorocentrum micans Ehrenberg
- Prorocentrum rostratum Stein
- Prorocentrum triangulatum Schiller

Coccolithophorida; Coccolithophoridaceae (Coccolithophores)
- Coccolithus huxleyi (Lohmann) Kamptner

Chrysophyta; Chrysophyceae (Silicoflagellates)
- Dictyocha fibula Ehrenberg
- Distephanus speculum (Ehrenberg) Haeckel

Table 54 (continued)

Chrysophyta; Cryptophyceae (Cryptomonads)
Cryptomonas sp. Ehrenberg

Chlorophyta; Chlorophyceae (Monads)
Monads

DISCUSSION

We feel that some degree of caution in interpretation of our results is warranted due to three methodological considerations relating to our analyses:

1. Results of microscopic examinations (Tables 1-54) are based on enumeration and evaluation of only one 50 ml aliquot of each sample; time constraints together with the large number of samples processed precluded analyses of replicates. Hence, statistically valid comparisons between samples have not been made. Although several workers have considered the issue of precision in plankton counting (see review by Venrick, 1978), as of now no uniform counting procedure has been accepted by all planktologists. Rather "The disparity of recommendations in the literature reflects different laboratory methods as well as different theoretical concepts and assumptions" (Venrick, 1978). Although precision is certainly a function of total cells counted, Shaw (1964) reported that whenever a taxon is present at only the 1% level in a population, it will likely be encountered (95% probability) when at least 300 cells are counted, as done in analyses of our samples. Of further relevance is the observation of Uehlinger (1964) that by counting cells in 30-40 microscope fields, one can reasonably estimate (within ±2s) the true sample mean (i.e. that obtained by counting all cells present in the entire settling chamber). In the present study, total counts (entire chamber) were made in all cases except for the densely populated samples (6, 7, UPS-N1, UPS-N5, 5-1, and 5-2). For each of these exceptions, cells in 42 microscope fields were counted. Hence, we feel that our counting methodology is defensible.

2. Considerable controversy exists regarding the validity of biomass estimates using the "total cell volume" technique as applied in the present investigation. Several of the important reservations held regarding the techniques have been reviewed elsewhere (e.g. Sicko-Goad et al., 1977; Smayda, 1978) and are as follows:

a) There is poor correlation between biovolume estimates and estimates using other techniques.

b) It is exceedingly difficult to estimate volume of microscopic irregularly shaped cells.

c) There are differing amounts of metabolizing cytoplasm, vacuolar volume and cell wall material between taxa.

d) The physiological state of the cell greatly affects cell size and proportions of the cellular components (i.e. those in c above).

e) Use of the technique results in an exaggeration of the contribution of larger celled taxa to phytoplankton community dynamics relative to smaller celled taxa.

Since it has been suggested that metabolizing biovolume may range from 30-80% of total cell volume depending on species, we assume that our biomass estimates greatly exceed ecologically significant values (e.g. metabolizing biovolume). However, despite its many shortcomings, determination of total cell volume remains an established procedure for indirectly estimating phytoplankton biomass.

3. Two different sample collection methods were employed in our study (the first using a towed pumping system and plankton cup for concentrating samples; the second utilizing unconcentrated water bottle samples obtained at various depths). Moreover, station samples to be analyzed were selected <u>a posteriori</u> according to presumed abundance of

phytoplankton as predicted from *in situ* flourescence measurements. Hence, between-sample comparisons as well as direct comparisons of our results to those of other workers employing systematic sampling strategies are a bit tenuous. Nevertheless, we feel that some general conclusions may be drawn from our analyses.

With respect to frontal zone dynamics, results for analyses of samples 1-7 (TUPS data from the southern survey area) are interesting in that they demonstrate substantial differences (total biomass and species composition) between the water masses on either side of the frontal boundary. Total biomass was substantially less (under 100*) north of and at the boundary (Samples 1-4) than south of the boundary (over 2000 in samples 6 and 7). *Ceratium tripos* was the dominant species of dinoflagellate in Samples 5-7 obtained at and south of the frontal boundary. Either *C. longipes* or *Peridinium depressum* was the dominant dinoflagellate north of the boundary (Samples 1-5). Biomass of dinoflagellates generally exceeded that of diatoms (exceptions were noted in Samples 3 and 6). Usually, *Guinardia flaccida* was the dominant species of diatom; *Coscinodiscus centralis* predominated in Sample 3. As noted earlier, use of all volume comparisons does tend to emphasize contributions made by larger-celled species (e.g. *Ceratium* spp., *Coscinodiscus* spp., *Guinardia* sp., etc.) which are often represented by relatively few cells. In most samples, the small dinoflagellate *Peridinium depressum* and diatom *Skeletonema costatum*, were the most abundant species in terms of numbers of individuals per unit volume. Neither coccolithophorids, silicoflagellates nor miscellaneous plankton (including monads) were of much importance in any of these samples.

Samples UPS N 1-UPS N 10 were made in the northern survey area using

*All biomass values are expressed as $mm^3 \times 10^{-6}/\ell$.

the TUPS (Sample UPS N 5 was at the frontal boundary while samples UPS N 1-4 and UPS N 6-10 were south and north of the boundary, respectively). As in the southern survey area, sample biomass was substantial at the frontal boundary (over 5800 in UPS N 5) relative to most others (generally less than 200), although sample UPS N 1, the southernmost station along this track, exhibited the highest value (over 7200). Except for sample UPS N 6, where Peridinium depressum was dominant in terms of biomass, Ceratium tripos was the dominant form in all samples. Although Guinardia flaccida and Coscinodiscus spp. were the dominant diatoms in most samples, in UPS N 6-9, Chaetoceros decipiens was the dominant form.

Biomass of coccolithophorids was substantial in the samples obtained in the northern survey area (in contrast to TUPS Samples 1-7 from the southern survey area); in samples UPS N 5 and UPS N 6, Coccolithus (=Emiliania) huxleyi was the dominant phytoplankter, in terms of total biomass. Although miscellaneous phytoplankton were more important in the northern than southern survey area, they still constituted a rather small proportion of total phytoplankton (1% of the total estimated biomass).

Finally, we noted that the diatoms, Leptocylindrus danicus, Rhizosolenia setigera and dinoflagellate, Peridinium depressum, were generally the most important species in terms of cell numbers. The former two species are rare to nonexistent in samples collected in the southern survey area.

Examination of TUPS Samples UPS S 1-4 revealed that total biomass was low for each. However, sample UPS S 3, obtained in the front, exhibited a higher biomass value than the others. Again, these four samples were dominated by the diatom species, Chaetoceros decipiens (UPS S 1-2), Coscinodiscus spp. (UPS S 1), Guinardia flaccida (UPS S 3) and dinoflagellate Ceratium tripos (UPS S 1-3). Coccolithus huxleyi was most

important in samples UPS S 1-2. Sample UPS S 4 exhibited the lowest estimated biomass (less than 5) of any we examined.

Results of analyses of bottle samples collected at various locations and depths in the southern survey area are provided in Tables 22-31. Since all of these samples were selected for analysis on the basis of predicted phytoplankton abundance (based on *in situ* flourescence measurements), we feel that direct comparisons of these samples with either one another or the TUPS samples would be rather tenuous. Hence, it comes as no surprise that biomass estimates for several of these samples (e.g. S-1, 5-2, 7-2, 8-1-1) far exceed those for other samples. However, a few conclusions regarding the results in Tables 22-31 may be drawn:

1. As with the TUPS samples collected in the southern region, coccolithophorids are virtually absent from the bottle samples. Exceptions were noted in Samples 6-1 and 7-2, located near the frontal boundary.

2. Many taxa which were either not observed or not important in TUPS samples from the southern survey region were rather important (in terms of biomass and/or cell numbers) in the bottle samples. For example, *Skeletonema costatum* (5-1,5-2), *Nitschia seriata* (5-1, 5-2) and *Leptocylindrus danicus* (8-1, 8-1-1, 10-1, 10-2) were very important in terms of numbers and biomass. Other species which were rare or nonexistent in the TUPS surface samples were noteworthy in the bottle samples. For example, *Ceratium fusus* (8-1, 8-1-1), *C . pentagonum* (8-1, 8-1-1, 10-1, 10-2), *Dinophysis caudata* (10-1) and *Coscinodiscus granii* (6-1, 7-2, 8-1, 8-1-1, 10-1) were fairly important.

3. In several of these samples, cell numbers of monads were substantially greater than in the TUPS samples (5-1, 5-2, 7-1).

4. Taxa which dominated the TUPS samples are also important in a number of the bottle samples (e.g. *C. tripos*, *Peridinium depressum*,

Guinardia flaccida and Coscinodiscus spp.).

Results for analyses of bottle samples obtained in the northern survey area are provided in Tables 32-52. Generally, biomass estimates for these are in fairly close agreement with the TUPS samples obtained in the northern survey area, as compared with the lack of agreement between TUPS and bottle samples obtained in the southern survey area (discussed earlier). In most cases, generalizations regarding Tables 32-52 are similar to those for the TUPS samples in regard to dominant species. However, a few analyses provided results which were somewhat surprising:

1. Monads constituted a high proportion of several samples and were especially noteworthy in samples collected at stations 14, 15, and 16.

2. Coccolithophorids, abundant in most of the TUPS samples collected in the northern survey area, were absent in a number of the station samples, including those at the frontal boundary (Stations 13 and 17).

Generally, we feel that many of the observations regarding dominant taxa are in fairly close agreement with several of the studies published for phytoplankton assemblages in the North Atlantic by Marshall and his coworkers (e.g. 1976, 1978, 1983, and 1984). Some of the observations we made which seem worthy of follow up in subsequent studies include the following.

1. We tentatively conclude that significant differences between phytoplankton assemblages are exhibited at ocean fronts. Rigorous analyses of samples from comparable depths at three sites (at and on both sides of the frontal boundary) should be performed in subsequent studies.

2. Several taxa were observed to exhibit dramatic changes in abundance with respect to biomass and cell numbers in the two survey areas. We feel that future counting efforts need to continue to focus on them. Possibly, they may be good indicators of frontal boundaries or other

phenomena related to water mass differences (e.g. coccolithophorids and monads).

3. Often, it appears that total biomass was greatest at or near the frontal boundaries. Testable hypotheses regarding this tentative conclusion could be developed for subsequent surveys.

Literature Cited

Fryxell, G. A., R. W. Gould, Jr., E. R. Balmori, and E. C. Theriot. 1985. Gulf Stream warm core rings: phytoplankton in two fall rings of different ages. J. Plank. Res. 7:339-364.

Hasle, G. R. 1978. The inverted-microscope method. In A. Sournia (ed.), Phytoplankton Manual, Monographs on Oceanographic Methodology, No. 6, p. 88-96. United Nations Educational, Scientific and Cultural Organization, Paris. 337 pp.

Kutkuhn, J. H. 1958. Notes on the precision of numerical and volumetric plankton estimates from small-sample concentrates. Limnol. Oceanogr. 3:69-83.

Lund, J. W. G., C. Kipling, and E. D. LeCren. 1958. The inverted microscope method of estimating algal numbers and the statistical basis of estimations by counting. Hydrobiologia 11:143-170.

Marshall, H. G. 1976. Phytoplankton distribution along the eastern coast of the USA. I. Phytoplankton composition. Marine Biol. 38:81-89.

Marshall, H. G. 1978. Phytoplankton distribution along the eastern coast of the USA. Part II. Seasonal assemblages north of Cape Hatteras, North Carolina. Marine Biol. 45:203-208.

Marshall, H. G. 1984. Phytoplankton of the northeastern shelf of the United States in relation to abundance, composition, cell volume, seasonal, and regional assemblages. Rapp. P.-v. Réun. Cons. int. Explor. Mer. 183:41-50.

Marshall, H. G. and M. S. Cohn. 1983. Distribution and composition of phytoplankton in northeastern coastal waters of the United States. Est. Coast. Shelf Sci. 17:119-131.

Shaw, A. B. 1964. Time in Stratigraphy, McGraw-Hill, N.Y. 365 pp.

Sicko-Goad, L., E. F. Stoermer, and B. G. Ladewski. 1977. A morphometric method for correcting phytoplankton cell volume estimates. Protoplasma 93:147-163.

Smayda, T. J. 1978. From phytoplankters to biomass. In A. Sournia (ed.), Phytoplankton Manual, Monographs on Oceanographic Methodology, No. 6, p. 273-279. United Nations Educational, Scientific and Cultural Organization, Paris. 337 pp.

Sournia, A. 1978. Phytoplankton Manual, Monographs on Oceanographic Methodology, No. 6. United Nations Educational, Scientific and Cultural Organization, Paris. 337 pp.

Throndsen, J. 1978. Preservation and storage. In A. Sournia (ed.), Phytoplankton Manual, Monographs on Oceanographic Methodology, No. 6, p. 69-74. United Nations Educational, Scientific and Cultural Organization, Paris. 337 pp.

Uehlinger, V. 1964. Etude statistique des méthodes de dénombrement planctonique. Arch. Sci. Genève, vol. 17, no. 2, p. 121-223.

Venrick, E. L. 1978. How many cells to count? In A. Sournia (ed.), Phytoplankton Manual, Monographs on Oceanographic Methodology, No. 6, p. 167-180. United Nations Educational, Scientific and Cultural Organization, Paris. 337 pp.

Woodmansee, R. A. and J. A. McLelland. 1984. Analysis of 93 North Pacific and Gulf of Alaska phytoplankton samples. Final report for the Naval Oceanographic Office.

Appendix I

Identification Aids Used in the Present Study

Cupp, E. E. 1943. Marine plankton diatoms of the west coast of North America. Bull. Scripps Instn. Oceanogr., Vol. 5, No. 1, p. 1-237 incl. pl. 1-5.

Curl, H., Jr. 1959. The phytoplankton of Apalachee Bay and the northeastern Gulf of Mexico. Institute of Marine Science, Vol. VI, p. 277-320.

Davis, D. C. 1955. The marine and fresh-water plankton. Mich. State Univ. Press. 563 pp.

Gaarder, K. R. and G. R. Hasle. 1971. Coccolithophorids of the Gulf of Mexico. Bull. Mar. Sci. 21:519-544.

Graham, H. W. and N. Bronikorsky. 1944. The genus Ceratium in the Pacific and North Atlantic Oceans. Scient. Results Cruise VII Carnegie 1928-29, Biol., Vol. 5, p. 1-209.

Lebour, M. V. 1925. The dinoflagellates of northern seas. Plymouth, Marine Biological Association. 250 p. incl. 35 pl.

Lebour, M. V. 1930. The planktonic diatoms of northern seas. London, Ray Soc. 244 p., 4 pl.

Marshall, H. G. 1968. Coccolithophores in the northwest Sargasso Sea. Limnol. Oceanogr. 13:370-376.

Marshall, H. G. 1971. Composition of phytoplankton off the southeastern coast of the United States. Bull. Mar. Sci. 21:806-825.

Marshall, H. G. 1976. Phytoplankton distribution along the eastern coast of the USA, I. Phytoplankton composition. Mar. Biol. 38:81-89.

Marshall, H. G. 1978. Phytoplankton distribution along the eastern coast of the USA, II. Seasonal assemblages north of Cape Hatteras, North

Carolina. Mar. Biol. 45:203-208.

McIntyre, A. and A. Bé. 1967. Modern coccolithophoridae of the Atlantic Ocean. I. Placoliths and crytoliths. Deep Sea Res. 14:561-597.

Okada, H. and A. McIntyre. 1977. Modern coccolithophores of the Pacific and North Atlantic Oceans. Micropaleontology 23:1-55, incl. pl. 1-13.

Saunders, R. P. and D. A. Glenn. 1969. Diatoms. Mem. Hourglass Cruises, Vol. 1, No. 3, p. 1-119, incl. pl. 1-16.

Steidinger, K. A. and J. Williams. 1970. Dinoflagellates. Mem. Hourglass Cruises, Vol. 2, p. 1-251, incl. pl. 1-45.

Vinyard, W. C. 1979. Diatoms of North America. Mad River Press, Inc. Eureka, California. 119 pp.

Wood, R. D. and J. Lutes. 1967. Guide to the phytoplankton of Narragansett Bay, Rhode Island. University of Rhode Island, Kingston, R.I. 76 pp.

Appendix II

Formulae Used for Cell Volume Calculations

Shape of Morphological Feature	Formula used
Spherical	$V = {}^{4}/_{3}\pi r^{3}$
Cylindrical	$V = \pi r^{2} L$
Ellipsoid	$V = {}^{4}/_{3}\pi \frac{L}{2} \frac{W}{2}^{2}$
Trianguloid	$V = \frac{L}{2} W \frac{L}{4}$
Conical	$V = {}^{1}/_{3}\pi r^{2} L$

Where V = cell volume, L = length, W = width, and $r = \frac{W}{2}$

Appendix III

SAMPLE NUMBER	FILE NAME
1	SAMPLEONE
2	SAMPLETWO
3	SAMPLETHREE
4	SAMPLEFOUR
5	SAMPLEFIVE
6	SAMPLESIX
7	SAMPLESEVEN
UPS-N1	UPSNONE
UPS-N2	UPSNTWO
UPS-N3	UPSNTHREE
UPS-N4	UPSNFOUR
UPS-N5	UPSNFIVE
UPS-N6	UPSNSIX
UPS-N7	UPSNSEVEN
UPS-N8	UPSNEIGHT
UPS-N9	UPSNNINE
UPS-N10	UPSNTEN
UPS-S1	UPSSONE
UPS-S2	UPSSTWO
UPS-S3	UPSSTHREE
UPS-S4	UPSSFOUR
5-1	FIVETWO
5-2	FIVEONE
6-1	SIXONE
6-2	SIXTWO
7-1	SEVENONE
7-2	SEVENTWO
8-1	EIGHTONE
8-1-1	EIGHTTWO
10-1	TENONE
10-2	TENTWO
11-1	ELEVENONE
11-2	ELEVENTWO
12-1	TWELVEONE
12-2	TWELVETWO
12-3	TWELVETHREE
12-4	TWELVEFOUR
13-1	THIRTONE
13-2	THIRTTWO
14-1	FOURTEEN
15-1	FIVETEONE
15-2	FIVETETWO
16-1	SIXTEONE
16-2	SIXTETWO
16-3	SIXTETHR
17-1	SEVTEONE
17-2	SEVTETWO
17-3	SEVTETHRE
23-1	TWENTONE
23-2	TWENTTWO
23-3	TWENTTHRE
23-4	TWENTFOUR

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

AD-A164985

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6. NAME OF PERFORMING ORGANIZATION University of Southern Mississippi	7a. NAME OF MONITORING ORGANIZATION Naval Ocean Research and Development Activity
6c. ADDRESS (City, State, and ZIP Code) Southern Station, Box 5018 Hattiesburg, MS 39406-5018	7b. ADDRESS (City, State, and ZIP Code) Ocean Science Directorate NSTL, MS 39529-5004
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Naval Ocean Research and Development Activity 8b. OFFICE SYMBOL (If applicable) Code 333	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N00014-85-K-0353
8c. ADDRESS (City, State, and ZIP Code) Ocean Science Directorate NSTL, MS 39529-5004	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO. 61153N; PROJECT NO.; TASK NO.; WORK UNIT NO.
11. TITLE (Include Security Classification) Ocear. Frontal Areas Phytoplankton Enumeration and Biomass Estimates -- Operation Guiding Light	
12. PERSONAL AUTHOR(S) Gary Anderson and Daniel Gustafson	
13a. TYPE OF REPORT Final 13b. TIME COVERED From _____ To _____	14. DATE OF REPORT (Yr., Mo., Day) January 1986 15. PAGE COUNT 75
16. SUPPLEMENTARY NOTATION	
17. COSATI CODES FIELD / GROUP / SUB. GR	18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) Ocean fronts, phytoplankton Continental

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

During the pilot field exercise for Operation Guiding Light (April-May, 1985), 39 phytoplankton samples were collected in the shelf-slope frontal region and 72 phytoplankton samples were collected in the Gulf Stream frontal region (both survey areas are located in the western North Atlantic Ocean). Samples were obtained using either a towed underwater pumping system (TUPS) at a depth of two meters or a rosette sampler (various depths) and preserved for subsequent analysis. For each sample we identified (to species, where possible) enumerated and estimated biomass of the phytoplankton present.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS ☐	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Gary Anderson	22b. TELEPHONE NUMBER (Include Area Code) (601) 266-4753 22c. OFFICE SYMBOL

DD FORM 1473, 83 APR EDITION OF 1 JAN 73 IS OBSOLETE.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

END

FILMED

3 -86

DTIC